Enabling non-genetic activity-driven maturation of iPSC-derived neurons

Grant Award Details

Enabling non-genetic activity-driven maturation of iPSC-derived neurons

Grant Type: Quest - Discovery Stage Research Projects

Grant Number: DISC2-13483

Investigator:

Name:	Alex Savtchenko
Institution:	Nanotools Bioscience
Type:	PI

Award Value: $675,000

Status: Pre-Active

Grant Application Details

Application Title: Enabling non-genetic activity-driven maturation of iPSC-derived neurons

Public Abstract:

Research Objective

We will empower stem cell biologists to generate iPSC-derived neurons faster and with enhanced maturation by enabling optical cell stimulation and triggering activity-dependent maturation processes

Impact

Our project will address such critical bottlenecks as insufficient maturity of iPSC-derived neurons that limits their utility in age-related neurological disorders that manifest later in life.

Major Proposed Activities

- To fabricate graphene-based substrates for iPSC-derived neurons and human brain cortical organoids in order to use them during subsequent activities for optical cell stimulation
- To subject iPSC-derived neurons to repeated patterns of optical stimulation over extended periods of time in order to trigger the electrical activity in neuronal networks
- To characterize the changes in functional activity of optically stimulated iPSC-derived neurons that occurred as a result of different optical stimulation protocols
- To characterize the impact of the cell activity triggered by optical stimulation on transcriptional and cell population dynamics during activity-dependent maturation
- To finalize the validated protocols for light-driven activity-dependent enhanced maturation of iPSC-derived neurons.

Statement of Benefit to California:	Neurological disorders are the leading cause of disability and the second leading cause of death. Disease models based on iPSC-neurons allow us to better understand the disease mechanisms and to develop efficacious treatments. However, these neurons often do not exhibit adult-like maturation, limiting the clinical predictiveness of adult disease models. We propose to address this bottleneck by enabling activity-dependent maturation via long-term graphene-based optical stimulation of neurons.

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